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ABSTRACT

This curriculum guide contains learning module outlines for a series of related mechanics courses to be given in high schools in Alberta. Each module provides selected learning experiences to develop basic competence in a number of related trades. Each module consists of an introduction, objectives, learning resources list, content summary, and a number of topics, each with a generalization and concepts/subconcepts related to learning tasks. The modules cover the following topics: an introductory course, power systems, framing--residential, residential wiring, machine shop, and introductory welding, on three levels. An optional developmental module also is included. An introductory section explains the industrial education program and the related mechanics courses in Alberta. (KC)

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RELATED MECHANICS

12-22-32

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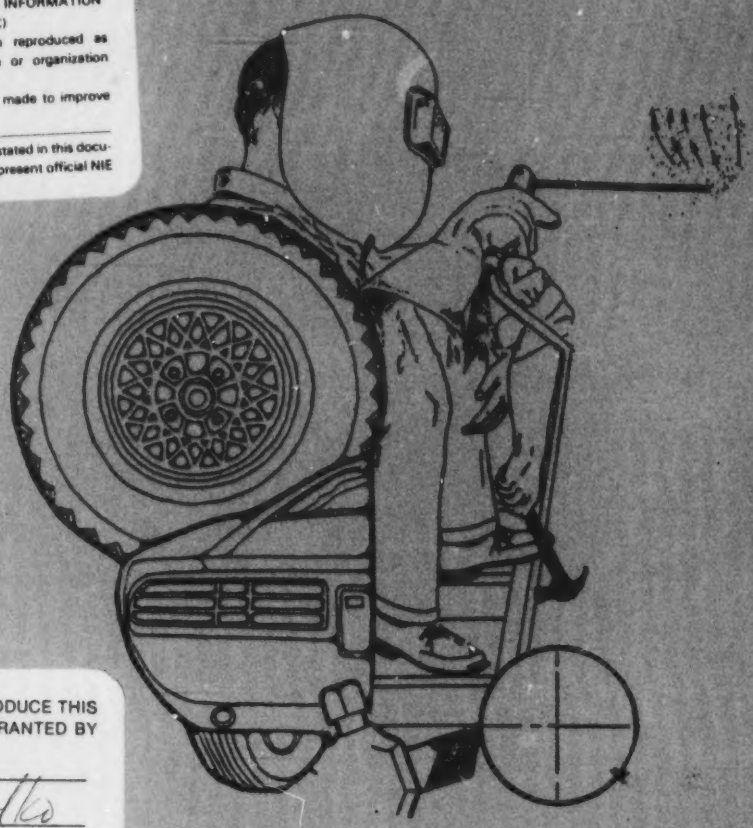

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INDUSTRIAL EDUCATION

Curriculum Alberta

CE 042 892

ACKNOWLEDGMENTS

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NOTE: This Curriculum Guide is a service publication only. The Senior High School Program of Studies contains the official statement concerning Senior High School courses. The information contained in the Guide is prescriptive insofar as it duplicates that contained in the Program of Studies. There are in the Guide, however, as well as content, methods of developing the concepts, suggestions for the use of teaching aids and lists of additional reference books.

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INDUSTRIAL EDUCATION

RATIONALE

Industrial Education is a program consisting of courses which provide a continuum of experiences, starting with exploratory activities in the junior high school and expanding in the high school to the development of skills related to career fields. This development of the student's skills is planned for through courses in industrial and vocational education culminating in on-the-job work experience, or entry into a job or post-high school institution for further education.

The program consists of courses ranging from those designed for an exploration of the technologies and trade areas to units of practical preparation for a career. In the process the courses develop the student's self-knowledge, talents and skills.

For information on sequencing and course description, refer to the "Industrial Education Manual for Guidance to Teachers, Counsellors and Administrators".

PROGRAMS

There are two parts to the Industrial Education program. The first part consists of the I.E. 10, 20, 30 series of courses and is designed for career orientation. These courses were developed primarily for students in laboratories that utilize the multiple activity approach as found in most smaller schools, but they can be taught in unit shops as well.

The second part consists of the I.E. 12, 22, 32 series of courses and is intended for career development. The courses are planned for use in schools where facilities are available to teach specific occupational areas.

Students may progress from the I.E. 10, 20, 30 series to the 22 level courses upon meeting specified basic prerequisites or upon recommendation of their principal.

Both sections of the program focus on six career fields. These are:

Graphic Communications
Mechanics
Construction and Fabrication
Electricity-Electronics
Personal Services
Horticulture

The I.E. 10, 20, 30 courses consist of a number of modules related to the career fields while the I.E. 12, 22, 32 courses consist of a number of five credit modules of specific occupational content. Completion of seven five credit modules qualifies the student for recognition by the Apprenticeship Branch for credit towards a journeyman's certificate.

Two modules taught for a total of 65 hours will serve as a pre-requisite for the appropriate 22 level course. It is left to the administrators of the school to offer the courses or combination of courses best suited to the needs and interests of the students and the financial resources of the district.

Courses offered at the 22 and 32 level have to meet special criteria for staff and facilities. The Industrial Education Consultant must authorize these in order to qualify the students for vocational grants.

OBJECTIVES OF INDUSTRIAL EDUCATION

The Industrial Education Program can help achieve the Goals of Schooling and Education. The course objectives are more focused and give direction to the teacher.

The objectives of Industrial Education are classified in three areas with the following purposes:

A. Personal Growth:

To provide opportunities for the individual growth of the student through the development of acceptable personal and social values necessary in a productive society.

1. To provide a technical environment which motivates and stimulates individuals to discover their interests and develop personal and social responsibilities.

2. To assist in the development of positive attitudes toward safety.

3. To assist in the development of positive attitudes toward conservation and environment.

4. To assist in the development of consumer literacy.

B. Career Exploration:

To provide students with experiences which will assist them in making realistic career choices.

1. To provide students an opportunity, within a technical environment to become acquainted with the general occupational characteristics of a variety of career fields.

2. To relate their own interests, abilities, likes, dislikes and values to several career fields.

C. Occupational Skills:

To develop basic competencies, integrating cognitive and psychomotor skills related to families of occupations.

1. To provide safe exploratory experiences in the use of tools, energy, equipment and materials appropriate to various technologies prevalent in a productive society.

2. To develop an understanding of the interrelationships of various technologies.

3. To provide a technical environment which permits students to synthesize their accumulated knowledge in the solution of practical problems, and to assist students to develop habits that will be conducive to the establishment of a safe environment.

INDUSTRIAL EDUCATION 12, 22, 32 PROGRAM

INTRODUCTION

The Industrial Education 12, 22, 32 program is a series of courses which develop competencies leading to six different career fields.

Entry into a career field may be gained by taking one of several related introductory courses. These are:

1. the "12" course designated for each major, or
2. two modules from the Industrial Education "10, 20, 30" series related to the anticipated major, or
3. one half of a "12" course. The other half would be another half "12" or a module from the "10" program. The course would be recorded as Industrial Education "10".

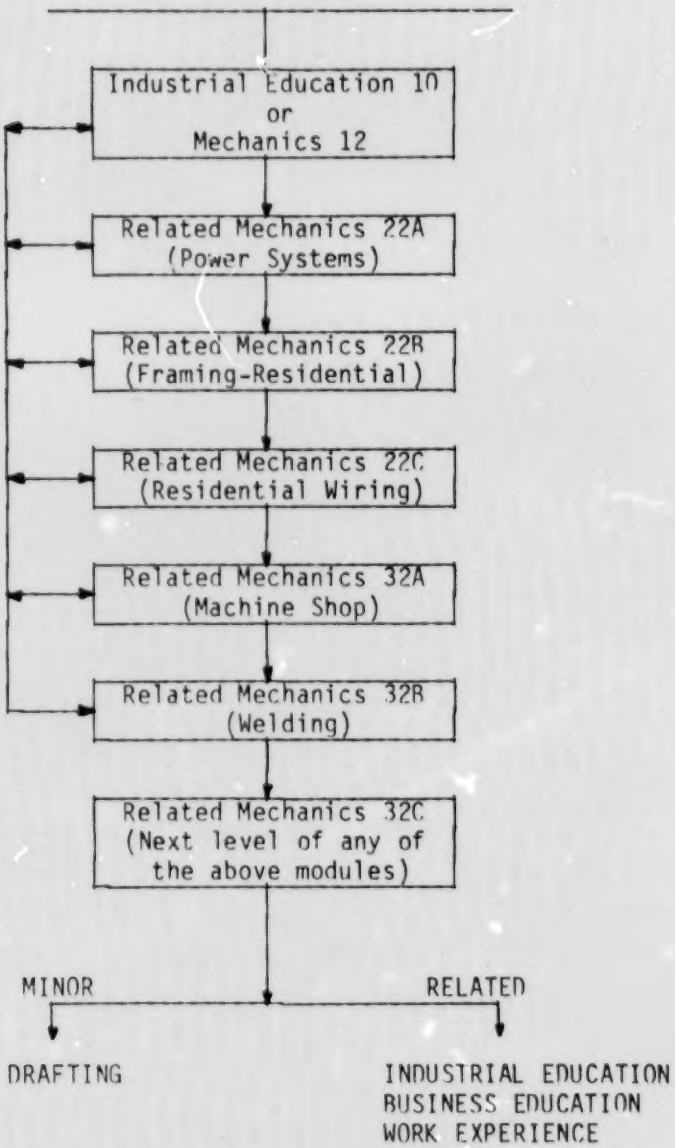
Following the introductory course the student may advance to the major area of study by selecting any number of five credit modules from the courses designated as "22" or "32". The scheduling and sequencing of the modules is the responsibility of the local school personnel but must be in accordance with the regulations pertaining to prerequisites.

A student registered in a second or third level course ("22" or "32") is regarded as taking a major in that course area. Having established a major the student may select courses designated as minors and in this way broaden his/her practical skill base in a career field or even several career fields. However, students must complete all the preceding modules in a major series (usually six) before taking the 32C module (exception: Beauty Culture).

CAREER FIELD

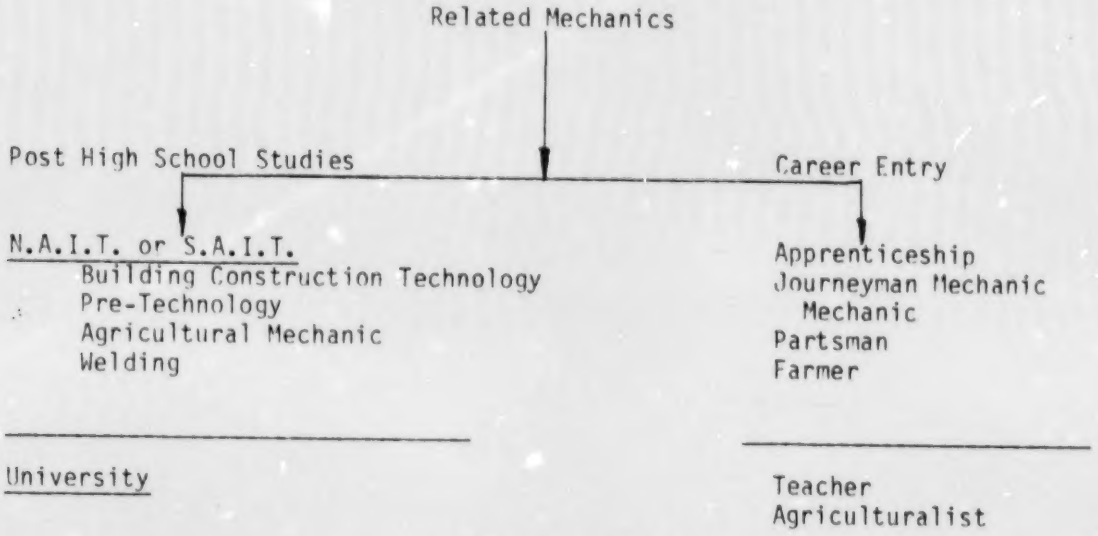
MECHANICS

RELATED MECHANICS



CAREER OPPORTUNITIES

Students taking all or most of the modules in the Related Mechanics major may look forward to the following opportunities:



RELATED MECHANICS 12, 22, 32 PROGRAM

Related Mechanics is a program designed to meet the needs of students planning careers in the agricultural sector of the Alberta economy. Entry into the program is through Mechanics 12 or Industrial Education 10.

Each module provides selected learning experiences to develop basic competence in a number of related trades. The course may be taught in a shop planned for related mechanics or by taking modules in related shops. As a substitute for the modules identified one developmental module may be used provided the content has been approved by the Associate Director of Curriculum for the Practical Arts.

MECHANICS 12

COURSE CONTENT
MECHANICS 12 (5 CREDITS)

INTRODUCTION

Mechanics 12 is an introductory course for Related Mechanics leading to all the major areas in the career field of mechanics. Students are introduced to power sources and methods of transmission. They study the construction and operation of machines; particularly the motor vehicle, and engage in the activities of testing, disassembly and assembly of machines, reading, research and applying information learned to analyzing and repairing minor machine problems.

OBJECTIVES

The specific objectives of the Mechanics 12 course are:

1. To enable the student to understand the use, care and control of the power machine.

2. To allow the student to gain an insight into the construction and operation of machines which convert energy to useful work.

3. To provide the student with realistic experiences so that he/she is better able to make a career choice based on accurate information.

4. To help the student understand the many basic laws and principles of science at work in mechanics, and relate these laws and principles to the vast area of power technology.

LEARNING RESOURCES

Stockel, M.W. Auto Mechanics Fundamentals Goodheart-Willcox Co. Inc., Latest Edition.
Beeler, Sam C. Understanding Your Car McKnight and McKnight, 1967
*Crouse, W.H. Automotive Mechanics McGraw-Hill, Ryerson. SI Edition, 1980.
Hill, H.G. Interpreting Automotive Systems Delmar, 1977
Nash, F.C. Automotive Fundamentals McGraw-Hill, 1977
Nash, F.C. Automotive Technology McGraw-Hill, 1979
Scott, E.F. and Toby, B. The Car Longman Group Ltd., 1978
Stahn, C.R. Automobile Construction and Operation
Steckner, T. Automotive Mechanics and Technology Gage Publishing Ltd.
*Thiessen, F. and Dales, Davis Automotive Principles and Service Prentice Hall, 1981.
Time Life, The Time Life Book of the Family Car Time Lifebooks
Films. Shell Oil Company of Canada
Filmstrip - Moreland Latchford

Service Manuals, Booklets, Charts, Films, Filmstrips etc. from General Motors, Ford and Chrysler Companies.
Look First at the Retail Automobile Business G.M. pamphlet
Your Future in the Automotive Industry Dawson Taylor; Richard Rosens Press
Find a Career in Auto Mechanics C.W. Harrison; Putman
Toboldt, W.K. Diesel Fundamentals, Service and Repair Goodheart-Willcox Inc.

*Refers to prescribed learning resources.

CONTENT SUMMARY:

1. Career Field Study
   - occupations
   - employment opportunities
   - trade certification

2. Safety
   - operation of tools and equipment
   - unsafe acts and conditions
   - accident reporting
   - compensation
   - first aid
   - safety program

3. Shop Practices
   - hand tools
   - measuring instruments
   - fasteners
   - specialized equipment
   - repair manuals and specifications

4. Automobile Care and Ownership
   - body maintenance
   - chassis inspection and maintenance
   - inspection and maintenance
   - insurance (optional)
   - vehicle purchasing (optional)

5. Power Sources
   - types of engines
   - methods of piston engine classification
   - piston engine terms
   - engine construction and operation

6. Engine Support Systems
   - fuel system
   - exhaust system
   - cooling system
   - lubricating system
   - electrical system

7. Transmission of Power
   - hydraulic systems
   - mechanical systems

TOPIC 1: CAREER FIELD STUDY VRM12

GENERALIZATION: There are many occupations within and related to the field of Mechanics.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Career Field Occupations	- make a survey of the various occupations available in the career field and list the entry requirements - list courses in his/her school system that lead to his/her career choice.		
2. Employment Opportunities: - local - regional - national	- discuss employment opportunities in the mechanics career field		
3. Trade Certification	- explain journeyman certification requirements and articulation with the Apprenticeship Branch - explain automotive training possibilities at institutes and colleges		

NOTES:

TOPIC 2: SAFETY VRM12

GENERALIZATION: A knowledge and practice of safety is essential in all lab. or shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Safe operation of tools and equipment	- operate safely tools and equipment such as: - hoists - jacking devices and stands - compressed air and equipment - hand tools - power equipment - welding equipment - lifting equipment - other equipment		
2. Unsafe acts and Conditions	- identify unsafe acts and conditions which could lead to injuries		
3. Accident Reporting	- explain purpose and use of accident report forms and report all accidents.		
4. Compensation	- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	- attend to all minor injuries		
6. Safety Program	- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 3: SHOP PRACTICES VRM12

GENERALIZATION: A knowledge of efficient shop practice includes the care and use of tools and equipment, fasteners, and the proper use of repair manuals and other information sources.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Hand Tools	- demonstrate correct use of basic hand tools such as: - wrenches - hammers - screwdrivers - chisels and punches - reamers - flaring tools - drills - taps and dies - stud and bolt removers - other		
2. Measuring Instruments	- demonstrate correct use of measuring tools such as: - feeler gauges - steel scales or rulers - micrometers - dial indicators - telescoping gauges - small hole gauges - other		
3. Fasteners	- correctly identify and describe application of fasteners such as: - bolts, screws and studs - thread designations - tensile strength - head and thread sizes - thread repair procedures - setscrews and keys - snaprings - pins - washers - chemical - other		

TOPIC 3: SHOP PRACTICES (continued) VRM12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Specialized Equipment	As the need arises, the student will be given instruction and demonstration in the proper use of any tools or equipment necessary to complete tasks outlined in the curriculum or developed by individual teachers. Included may be tools such as: - battery hydrometer - anti-freeze tester - fan belt tension gauge - other		
5. Repair Manuals and Specifications	Given instruction the student will: - be able to select the correct manual and the applicable section - become familiar with the process of reading and using a repair manual and specifications		

NOTES:

TOPIC 4: AUTOMOBILE CARE AND OWNERSHIP VRM12

GENERALIZATION: Scheduled maintenance and inspection is important to the efficient operation of a unit.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		

1. Body Maintenance	- wash and clean a vehicle
	  - interior and exterior
	- polish a vehicle
	
	- remove stains such as:
	  - grease and oil
	  - blood
	  - lipstick
	  - etc.		

2. Chassis inspection and maintenance	- identify and locate lubrication reservoirs
	
	- explain how moving parts receive lubrication
	
	- lubricate a vehicle using correct oils and greases
	
	- check fluid levels
	  - radiator; including anti-freeze strength
	  - engine crankcase
	  - transmission and (transfer case)
	  - axle(s)
	  - windshield washer fluid
	  - brake (and clutch) reservoirs
	  - etc.		

NOTES:

TOPIC 4: AUTOMOBILE CARE AND OWNERSHIP (continued) VRM12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- Inspection and Maintenance	- make checks of - battery connections - oil and coolant leaks - tire condition and pressures - lights and horn - air cleaner - windshield wipers - fan and other belts - hose condition - etc. - perform minor repairs and adjustments such as: - tire repair - belt replacement - filter(s) replacement - wiper blade replacement - etc.		
3. Insurance (optional)	- read an insurance policy and list the coverage on: - property damage - injury liability - collision and upset - comprehensive - medical payments - etc. - calculate the cost of insurance considering age and locality		
4. Vehicle Purchasing (optional)	- evaluate the advantages and disadvantages of buying a new or used vehicle - devise a check list for use when buying a new or used vehicle - note ways of having vehicles inspected prior to purchase		

NOTES:

TOPIC 5: POWER SOURCES VRM12

GENERALIZATION: Engines are fundamental to modern industrial society.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Types			
- External	- analyze the operating fundamentals of an external combustion engine - e.g. steam engine		
- Internal	- analyze the operating fundamentals of the internal combustion engine e.g., - piston engine (2 and 4 stroke) - rotary - turbine Note: General fundamentals and comparisons only - detailed study of the piston engine follows.		
2. Methods of piston engine classification	- analyze the various piston engines under headings such as: - design - cooling methods - stroke cycle - head design - valve arrangement - induction methods - cylinder arrangement - type of fuel - etc.		

NOTES:

TOPIC 5: POWER SOURCES (continued) VRM12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Piston Engine terms	- study the meanings and methods of calculating the following where applicable: - bore - stroke - throw - clearance volume - piston displacement - total volume - compression ratio - torque - horsepower - etc.		
4. Engine Construction and Operation	- The intent of this learning task(s) is to have the student correctly disassemble, inspect, measure and reassemble correctly an engine. Repair procedures other than replacing broken or missing parts or repairing damaged threads are not included in this general overview course. - use a shop unit(s) and reference material to study the construction, operation, parts, function, measurements and installation procedures of the following components (where applicable): - engine block - pistons and rings - connecting rods - crankshaft - camshaft - valve train - cylinder head - bearings, seals and gaskets		

NOTES:

TOPIC 6: ENGINE SUPPORT SYSTEMS VRM12

GENERALIZATION: Engines require support systems for continuous operation.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Fuel System			
- Types of Fuel	- recognize the various fuel types such as: - gasoline - diesel - LPG		
- Fuel Pump	- list the parts - explain its operation		
- Carburetor	- explain the function in a general way - list the major parts - explain the difference between various types such as: - single, two, and four barrel - updraft, downdraft and sidedraft - adjust a carburetor idle mixture and speed - adjust the automatic choke (if equipped) - discuss methods of increasing gas mileage: - driving habits - tire pressures - etc.		
- Fuel Injection	- discuss: - gasoline - diesel		

NOTES:

TOPIC 6: ENGINE SUPPORT SYSTEMS (continued) VRM12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Exhaust System	- explain the dangers of a leak in the exhaust system - check the condition of: - exhaust pipe - muffler and/or resonator - tail pipe(s) - catalytic convertor		
3. Cooling System	- explain the need for a cooling system - list the parts and their functions - discuss the uses and types of anti-freeze solutions - examine an air cooled engine design		
4. Lubrication System			
- Oil pump	- list the parts - explain its operation		
- Filtering System	- explain its function - discuss full flow and partial flow systems		
- Oil	- classify oils used - viscosity - service ratings		
- Crankcase Ventilation	- identify the parts and functions - perform minor service - e.g. PCV valve		

NOTES:

TOPIC 6: ENGINE SUPPORT SYSTEMS (continued) VRM12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Electrical System			
- Battery	- identify the parts and materials - test the battery - prepare it for charging and charge it - identify "maintenance free" battery - clean battery and connections - observe safety around a battery		
- Alternator or Generator	- discuss its function - locate it on the vehicle		
- Charging Controls	- describe the functions of various controls in a general way - locate on the vehicle		
- Starter	- discuss its function and operation - locate it on the vehicle		
- Ignition System	- list the parts - describe the function and operation in a general way - locate the parts on a vehicle		

NOTES:

TOPIC 7: TRANSMISSION OF POWER VRM12

GENERALIZATION: The transmission of power can be accomplished through fluid or mechanical means.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Hydraulic Systems			

- Brakes	- list the parts
	- describe the operation
	- relate to each other:
	  - force, pressure, area and relative movement
	- disassemble and assemble the following units following approved procedures:
	  - master cylinder
	  - wheel cylinder
	  - wheel assemblies
	  - drum type
	  - disc type
	  - parking brakes		

2. Mechanical Systems			
- Power Train - Clutch	- identify clutch parts - explain clutch operation		
- Transmission	- list the parts - discuss gear types and calculate ratios - explain path of power - explain synchromesh - explain detent and interlock - disassemble and assemble a transmission using correct procedures		
- Drive Line	- identify parts - explain operation		

RELATED MECHANICS 22A

COURSE CONTENT
RELATED MECHANICS 22A (5 CREDITS)

(Power Systems)

INTRODUCTION

The Related Mechanics 22A module may be taken at any time following the completion of Mechanics 12.

OBJECTIVES

The objectives of the Related Mechanics 22A module are:

1. To develop in the student some of the attitudes and skills required of a motor mechanic;

2. To familiarize the student with automotive engines, and thus relate his/her theoretical background to engine repair;

3. To develop in the student the habits of critical thinking in the analysis of engine problems;

4. To accustom the student to utilize manufacturers' manuals and a variety of technical publications.

5. To provide the student with a basis for further study into power systems at a more advanced level.

LEARNING RESOURCES

*Crouse, W., Automotive Mechanics, SI Metric Ed., McGraw-Hill Ryerson, 1980.
Stockel, M.W., Auto Service and Repair Goodheart-Willcox Co., Latest Ed.
*Thiessen, F. Dales, Davis. Automotive Principles and Service Prentice Hall, 1981.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. The internal combustion engine
   - construction and operation

2. The maintenance and repair of the internal combustion engine
   - disassembly procedure
   - engine assembly
   - tune-up
   - sequence of operations

3. Engine support systems
   - cooling
   - lubrication

TOPIC 1: THE INTERNAL COMBUSTION ENGINE VRM22A

GENERALIZATION: All internal combustion engines are basically similar in theory, design and maintenance.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Construction and Operation	The student will:
	- relate the concepts of the molecular theory of matter, atmospheric pressure and energy to:
	  - valve motion
	  - the four-stroke cycle
	  - the factors affecting power output
	  - the efficiency of the engine
	  - engine horsepower
	- investigate the relationship and function of the engine components
	  - crankshaft and block assembly
	  - camshaft and related parts
	  - pistons and connecting rods
	- investigate and compare a variety of engine designs, their construction and operation:
	  - Vee versus in-line
	  - overhead camshaft
	  - air and liquid cooled
	  - rotary and reciprocating		

NOTES:

TOPIC 2: THE MAINTENANCE AND REPAIR OF THE INTERNAL COMBUSTION ENGINE VRM22A

GENERALIZATION: The internal combustion engine requires the adjustment or replacement of parts to maintain peak performance, economy, and minimum pollution.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Engine Disassembly	- disassemble an engine following the manufacturers recommendations		
- Parts	- analyze engine deposits		
- Cleaning - Inspection	- employ correct cleaning procedures of components		
- Measurement	- use measuring tools with care		
- Measuring devices	- analyze the variety of engine problems		
	- determine the size, fit and clearance of engine components		
2. Engine Assembly			
- Sub-assemblies - Lubrication - Safety factors	- employ a variety of testing devices to determine and isolate engine problems, and correct these problems		
3. Tune-Up - Electrical	- investigate the visual and mechanical tests required to tune an engine:		

NOTES:

TOPIC 2: THE MAINTENANCE AND REPAIR OF THE INTERNAL COMBUSTION ENGINE (continued) VRM22A

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- Fuel - Cooling - Mechanical	- battery and cables - cranking motor and circuit - engine mechanical condition - spark plugs - distributors and ignition circuit service - manifold and emission system service - carburetor and fuel system service - charging system - general vehicle inspection		
4. Sequence of Operations	- follow a sequence of operations in performing a tune-up. One such sequence is: - test battery - check spark plugs - check compression - check starting system - check fuel system - check ignition system - check charging system - road test if possible NOTE: Each part of the sequence can be enlarged on or the sequence can be modified slightly. Tests should be performed on a live engine.		

NOTES:

TOPIC 3: ENGINE SUPPORT SYSTEMS VRM22A

GENERALIZATION: For continuous operation the internal combustion engine depends on a number of support systems.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Cooling			
- Types	- using the appropriate text books and vehicles in the shop compare the two types of cooling systems, air and liquid		
- Parts	- outline the parts of the liquid and air cooling system. Compare and contrast the two systems.		
	- compare the two systems in monitoring a proper operating temperature and the method of dissipating surplus heat		
	- compare and contrast the anti-freeze used with iron and aluminium engines		
	- describe how the temperature indicators work on a liquid and air cooled system		
2. Lubrication			
- Oil	- using a text book describe the properties that a good lubricant must have:		
- Properties	- viscosity - viscosity index - extreme pressure - service ratings		

NOTES:

TOPIC 3: ENGINE SUPPORT SYSTEMS (continued) VRM22A

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
- Lubricants -Deterioration -Types -Characteris-tics -Functions -Cooling -Cleaning - Distribution	- using a suitable text compare and contrast the different types of lubricants - compare the lubricants for viscosity, smell, etc. - describe different types of filters how they clean the lubricant and how much servicing is required - describe how the lubricant is cooled - describe how the crank case ventilation system works - describe the different methods of lubricant distribution: - pressure - splash - combination - drip system - immersion - describe how each system works and how the lubricating system is protected - oil pump - control mechanism - indicators		

NOTES:

RELATED MECHANICS 22B

COURSE CONTENT

RELATED MECHANICS 228 (5 CREDITS)

(FRAMING - RESIDENTIAL)

INTRODUCTION

This course is open to any student who has completed Industrial Education 10 or Related Mechanics 12.

OBJECTIVES

The objectives of the Related Mechanics 228 module are:

1. To give the student practical experience in house framing.
2. To give the student a basic knowledge of various types of framing and layout procedures in accordance with the codes regulating construction.
3. To give the student practical experience in material quantity and cost estimating.

LEARNING RESOURCES

Cannon, K.F. and Hatley, F.G. Building Construction Technology. McGraw-Hill Ryerson 1982.
Canadian Wood Council. Construction Guide for Preserved Wood Foundations, (Latest Edition). 701-170 Laurier Avenue, West, Ottawa, Ontario, K1P 5V5.
Central Mortgage Housing Corporation, National Research Council. The Residential Standards - National Building Code.
Central Mortgage Housing Corporation, Ottawa. Canadian Wood-Frame House Construction.
Jones, R.P. Framing, Sheathing and Insulation. Delmar Publishers (Canada) Ltd., 1410 Birchmount Road, Scarborough, Ontario.
*Miller, H.G. Building Construction-Materials and Methods. Macmillan of Canada, Toronto. (Gage Publishing Ltd.)
Smith, R. Materials of Construction. (3rd Edition). McGraw-Hill Ryerson.
Smith, R. Principles and Practices of Light Construction. Prentice-Hall, 1980.
Wagner, Willis H. Modern Carpentry. Goodheart-Willcox, 1979.

*Refers to prescribed learning resource.

CONTENT SUMMARY

1. Floor Support and Framing Systems

   - wood foundations
   - built-up beams, girders and columns
   - floor joist systems
   - bracing
   - floor sheathing
   - quantity and cost survey

2. Wall Framing

   - basic framing systems
   - platform framing
   - wall sheathing
   - quantity and cost survey

3. Ceiling and Roof Framing

   - ceiling framing
   - roof framing
   - cornice work
   - roof sheathing
   - special ceiling and roof framing systems

TOPIC 1: FLOOR SUPPORT AND FRAMING SYSTEMS VRM22B

GENERALIZATION: Accurate lay-out and erection of floor support and framing systems is basic to quality construction.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	30	
1. Wood Foundations	- identify the components of a wood foundation system: base preparation; sole plate; studs; sheathing; water-proofing; floor slab; back-filling - describe the procedures for: site preparation; types of footings; special framing techniques		
2. Built-up Beams, Girders and Columns	- identify several residential types: Posts: solid timber; built-up; spaced; concrete; steel adjustable Beams: solid timber; built-up (laminated); concrete; box beam; wood and steel; steel I; bearing walls - using Residential Standards recommend, design and/or construct beam, girder and column systems for prescribed spans, jobs and loads		

NOTES:

TOPIC 1: FLOOR SUPPORT AND FRAMING SYSTEMS (continued) VRM22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Floor Joist Systems	- identify several types of residential floor joists: solid timber; concrete; steel; truss - using Residential Standards recommend joist size and o.c. spacing for prescribed spans, jobs, and loads - describe or identify acceptable joist to beam connecting systems: overlap; joist hangers; ledgers and ribbons		
4. Bracing	- state the main functions of, and identify a number of acceptable bridging systems: solid blocking; strip; cross bridging (wood); continuous metal; nailess metal - lay out and cut wood cross bridging for floor joist - construct scale models, sectional mock-ups, or actual job structures of floor frames including: o.c. lay out; sill assembly; beam placement; floor openings, bridging placement		
5. Floor Sheathing	- name various types of sub-flooring: solid lumber - T & G; shiplap; square edge panel type - plywood - composition		

NOTES:

TOPIC 1: FLOOR SUPPORT AND FRAMING SYSTEMS (continued) VRM22R

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	- using Residential Standards suggest suitable subfloor for prescribed joist spacing indicating proper fastening systems: nails; staples; adhesives; screws		
6. Quantity and Cost Survey	From blueprints and working drawings, using current prices, students will: - estimate material quantities and costs for complete floor framing systems including: posts and beams; floor joists; bracing; floor sheathing; fastening systems - include in estimates acceptable limits for wastage - use current units of measurement		

NOTE: Throughout this section, field trips to construction sites are recommended for purposes of firsthand experience in identifying and recognizing structural systems and components.

TOPIC 2: WALL FRAMING VRM22B

GENERALIZATION: There are several basic framing systems presently employed in Canadian residential construction. In Alberta, the most common framing method is platform or Western.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	40	
1. Basic Framing Systems: - platform - balloon - post and beam - plank wall - rigid frame - log - masonry - arch rib	- discuss the various systems, noting structural and aesthetic advantages and disadvantages of each, and assembling methods - identify the components of each framing method as to: name; purposes; standard sizes		
2. Platform Framing	- construct scale models, sectional mock-ups or actual building projects requiring: plate lay-out; stud placing and nailing; framed wall opening; corner post assembly; sway bracing; wall erection to square and plumb; from Residential Standards, determine proper stud size and spacing, lintel sizes and fastening specifications		
3. Sheathing (wall)	- examine various common sheathing materials and types and discuss the advantages and disadvantages of each - from Residential Standards determine appropriate sheathing fastening methods		

NOTES:

TOPIC 2: WALL FRAMING (continued) VRM22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Quantity and Cost Survey	- from blueprints and working drawings, using current prices; - estimate material quantities and costs for complete wall framing with emphasis on the platform system, including: plates; studding; wall openings; bracing; wall sheathing; fastening systems - include in estimates acceptable limits for wastage - use current units of measurement		

NOTE: Field trips would enhance this section considerably.

TOPIC 3: CEILING AND ROOF FRAMING VRM22B

GENERALIZATION: An integral part of completing the house frame is a well designed and carefully constructed ceiling and roof system.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Ceiling Frame	The student will: - select thickness and width for ceiling joists and beams to suit various spans - attach joists over a beam and to the side of a flush beam (joist hangers, ledgers, etc.)	55	

TOPIC 3: CEILING AND ROOF FRAMING (continued) VRM22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	- frame rough openings and install backing and blocking for partitions and ceiling finish		
2. Roof Framing	- recognize or describe common roof designs: flat; shed; gable; cottage or hip; intersecting; Gambrel; Mansard		
	- define and explain the relationships between the terms rise, run, slope, and line length		
	- identify the two major tasks in rafter lay-out: calculation of length; layout of exact angles		
	- name the types of rafters used for each roof type		
	- use several methods to calculate rafter line length: scaling the square; scale drawing; mathematical; step-off; rafter table on framing square		
	- on full size stock, lay out several of each rafter type, showing all calculations, adjustments, and cutting lines: common rafter; hip rafter; valley rafter; jack rafter		
	- construct a roof model of convenient size and type		

TOPIC 3: CEILING AND ROOF FRAMING (continued) VRM22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	- from Residential Standards, select proper rafter stock and o.c. spacings for prescribed roof problems		
3. Cornice Work	- show by shop drawing or describe a completed cornice including: rafter tail cuts; rough and finish fascia; look-out framing; soffits		
	- complete cornice of above mentioned roof model		
4. Roof Sheathing	- identify various roof sheathing materials and systems: solid lumber (solid cover); solid lumber (spaced); panel type		
5. Special Ceiling and Roof Framing Systems	- name and draw several common roof trusses: W-truss; king post truss; scissor truss; blow string truss, etc.		
	- explain the load bearing principle of trusses		
	- discuss various truss connectors: gusset plates; shear plates; split rings		
	- with reference to Residential Standards construct scale models of several types of trusses emphasizing spans, and stock size		

NOTE:

TOPIC 3: CEILING AND ROOF FRAMING (continued) VRM22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
6. Quantities and Cost Survey	- from blueprints and working drawings, using current prices: - estimate material quantities and costs for complete roof frames of the types: flat roof; gable roof; cottage or hip roof - estimates to include: ceiling joists; ceiling backing; rafters; ridge boards; collar ties; rough fascia; lookout framing; roof sheathing; fastening systems - include in estimates, acceptable limits for wastage - make comparative estimates on conventional rafter type roof framing as opposed to trussed type roof framing - use current units of measurement		

NOTE: Again, study of actual roofs while on field trips would prove useful.

This complete module, Related Mechanics 22B, could be greatly enhanced if the class could assume the task of constructing a project such as a garage, small cottage or some similar structure. Emphasis must be placed on planning, organizing, cooperating, and job safety from the beginning to end.

RELATED MECHANICS 22C

COURSE CONTENT

RELATED MECHANICS 22C (5 CREDITS)

(RESIDENTIAL WIRING)

INTRODUCTION

Related Mechanics 22C introduces the student to basic residential wiring. The introductory course Industrial Education 10 or Mechanics 12 are prerequisite.

OBJECTIVES

The objectives of the Related Mechanics 22C module are:

1. To introduce the student to concepts of electrical wiring in the home.
2. To allow the student to develop skill in the use of tools, equipment, and instruments peculiar to the electrical field.
3. To familiarize the student with the electrical codes and their application.

LEARNING RESOURCES

*Canadian Electrical Code, Current or latest approved Ed. C.S.A.

*Clidero & Sharpe, Applications of Electrical Construction 2nd Ed. General Publishing.

Miller, R. and Culpepper, F.W. Energy: Electricity/Electronics Gage Publishing Co. 1981.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Career opportunities

2. Safety

3. Residential Wiring Installations
   - planning
   - installation
   - re-wiring

4. Management Practices
   - organization
   - bidding for work
   - employee concerns

TOPIC 1: CAREER OPPORTUNITIES IN ELECTRICITY VRM22C

GENERALIZATION: A knowledge of the career opportunities in electricity will help the student make a more rational choice of school courses that prepare him for a future job.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. The Career: - residential wiring is only a small facet of the electrical field	- investigate the career opportunities in the electrical field by: - listing the number of residential starts in the province - interviewing electrical contractors to determine hours/start		Discussion. Career film. Visit by power co. official Government publications
- commercial wiring must be taken to be eligible for "time-off" on apprenticeship	- study the Apprenticeship Act of Alberta and list its requirements		Lecture/ Discussion with aid of government brochures

NOTES:

TOPIC 2: SAFETY VRM22C

GENERALIZATION: Safety is of prime importance to the well being of persons and equipment.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Unsafe Act	- list the consequences of acts in electricity particularly as they relate to: - electric wires - earth		
2. Unsafe Condition	- discuss how to identify conditions which could lead to injuries on the job		
	- identify common electrical faults		
3. First Aid	- perform artificial respiration		
	- treat for shock		

NOTES:

TOPIC 3: RESIDENTIAL WIRING INSTALLATIONS VRM22C

GENERALIZATION: The function of residential wiring is to provide safe and sufficient power distribution in the home.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Planning	- given a variety of floor plans of rooms and structures locate power and lighting outlets and control stations using electrical symbols		Calgary Power Guide Code Section #26 & #2.
2. Installation	- through a series of graduated exercises from wiring boards and mock-ups through projects of basement development, renovations, garages, cabins and houses, install all common electrical materials and devices, such as: boxes, conductors, NMS, raceways, services, lighting, heating, smoke detectors		#2, #3, #4, C & S. #7, C & S CEC #12. #5, C & S CEC #4. #14 C & S. #8 C & S. #15, C & S, CEC #6. #18, C & S, CEC #30.
3. Rewiring	- add outlets and control stations to finished structures		Calgary Power, Northwestern Utilities Publications

NOTES:

TOPIC 4: MANAGEMENT PRACTICES VRM22C

GENERALIZATION: An understanding of relationships between employer and employee, unions and management and regulations that bind both is essential to help all concerned meet their responsibilities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Business Organization and Procedures	- discuss different types of businesses, laws that regulate them and some advantages/disadvantages of each		Government pamphlets Business forms
	- discuss the methods of invoicing, stock taking, billing and collecting tardy accounts		
2. Bidding on work	- given a variety of rooms and structures, prepare an accurate bid using i) detail take-off sheets ii) contractor's estimate forms		Supplier catalogues, price sheets, contractors forms
3. Employee Concerns:			
- The interests of the worker are protected by various means. Legislation.	- discuss the responsibilities in contributions towards U.I.C., pension, medical		Union brochures, union representatives
- Employee groups	- discuss the various employee groups, advantages and disadvantages and his/her expectations		
	- demonstrate knowledge of Worker's Compensation Board Regulations and procedures		Worker's Compensation Board publications

RELATED MECHANICS 32A

COURSE CONTENT

RELATED MECHANICS 32A

(BENCHWORK AND LATHE OPERATIONS)

INTRODUCTION

Related Mechanics 32A is designed to provide the student with theory and practice in: Safety, machine maintenance, blueprint reading, layout and measurement, benchwork, machine tools, basic metallurgy and occupational information.

OBJECTIVES

The objectives of the Related Mechanics 32A module are:

1. To provide the student with basic machine shop orientation and safety instruction.

2. To teach the student basic skills in machine lubrication and maintenance.

3. To provide the student with an opportunity to perform practical operations using hand tools and machine tools.

4. To give the student career and occupational information.

LEARNING RESOURCES

*Krar, S.F. & St. Amand J.E., Machine Shop Training (3rd ed.) 1977 McGraw-Hill Ryerson.

Hallet, Fred H. Machine Shop Theory Practice (Revised edition) MacMillan Co. of Canada, Toronto.

*Refers to prescribed learning resource.

CONTENT SUMMARY:

1. Safety consciousness
   - unsafe acts and conditions

2. General Machine Shop Maintenance
   - machine lubrication
   - machine tool maintenance and repair
   - proper use and care of all tools and equipment

3. Blueprint reading
   - object visualization and drawing interpretation

4. Layout and measurement
   - measuring
   - layout

5. Benchwork
   - hand tools

6. Machine tools
   - material removal by machining

7. Metallurgy
   - steel

8. Metal working occupations
   - career opportunities

TOPIC 1: SAFETY CONSCIOUSNESS VRM32A

GENERALIZATION: Knowledge and safety practice is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Unsafe acts and conditions	The student will: - identify consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas - discuss how to identify conditions which could lead to injuries on the job and identify these conditions - list benefits available under the Occupational Health and Safety Division - maintain a safe and healthy working environment	3 hours	

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VRM32A

GENERALIZATION: Proper care and lubrication of machine tools increases their efficiency and tool life.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Machine lubrication	- follow the manufacturers' recommended lubrication procedure - identify and select the proper lubricant for each different application		
2. Machine tool maintenance and repair	- set up and make minor repairs to equipment, when necessary		
3. Proper use and care of all tools and equipment	- develop proper operating procedures when using shop equipment - keep all cutting tools in a safe and sharpened condition		

NOTES:

TOPIC 3: BLUEPRINT READING VRM32A

GENERALIZATION: A person working in a machine shop must develop the ability to read and understand technical drawings.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Blueprint Reading	The student will: - interpret and visualize objects through the use of simple project prints and other suitable drawings.	5 hours	

TOPIC 4: LAYOUT AND MEASUREMENT VRM32A

GENERALIZATION: Measurement and layout are essential in the manufacture and repair of most products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Measuring	The student will: - identify, name, describe and correctly read various measuring tools and instruments in both the imperial and metric systems: - steel rule - protractor - calipers - inside, outside - micrometers - drill gauge - vernier caliper - other measuring tools	8 hours	

TOPIC 4: LAYOUT AND MEASUREMENT (continued) VRM32A

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Layout	- identify, name, describe and correctly use the following tools on a product requiring their use: - scriber - layout dye or blue - prick and centre punch - steel rule - dividers - template - surface plate and gauge - other layout tools		

TOPIC 5: BENCHWORK VRM32A

GENERALIZATION: Materials are shaped by removing, combining and forming, using hand tools.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Hand Tools	The student will: - name, identify and select the following hand tools for any given job: - hammers and metal stamps - screwdrivers and wrenches - hacksaws and blades - cold chisels and punches - files - abrasive cloth - taps and dies - pliers - fasteners - other hand tools - demonstrate safe working habits using hand tools	30 hours	

TOPIC 6: MACHINE TOOLS VRM32A

GENERALIZATION: Materials are shaped to size by using machine tools.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Machine tools	The student will: - remove material using the following machine tools on assigned projects: - lathe: - facing and centre drilling - rough and finish machining - grooving and parting - filing, polishing and de-burring - other operations - shaper: (optional) - simple operations - drilling machines: - centre drilling - drilling - countersinking - counterboring - reaming - other operations - grinders - off-hand grinding - power saws - milling machine: (optional) - simple operations - demonstrate safe working procedures while operating machines	68 hours	

NOTES:

TOPIC 7: METALLURGY VRM32A

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Steel	The student will: - demonstrate a basic understanding of the following: - production of pig iron, steel, cast iron - forging - heat treatment - testing - hardness - spark - properties of steel - harden and temper a project	3 hours	

TOPIC 8: METAL WORKING OCCUPATIONS VRM32A

GENERALIZATION: Many occupations are available to students who have machine shop training.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Career Opportunities	The student will: - list occupations open to young people who have basic machine shop training - explore other related trades	2 hours	

NOTES:

RELATED MECHANICS 32B

COURSE CONTENT

RELATED MECHANICS 32B (5 CREDITS)

(INTRODUCTORY WELDING)

INTRODUCTION

Related Mechanics 32B (Introductory Welding) provides the opportunity for students to explore the subject of welding and develop introductory level skills.

OBJECTIVES

The objectives of the Related Mechanics 32B module are:

1. To give the student an understanding of the role of the welder in industrial society.

2. To introduce the student to the safe use of tools and acceptable procedures basic to the welding trade.

LEARNING RESOURCES

*Pender, J.A. Welding McGraw-Hill Ryerson, 1978
(Student guide and Teacher key also available).

Tuttle, C.A. Fundamentals of Oxy-Acetylene and Arc Welding
Pitman (Canada) Ltd.

Griffin & Rodden, Basic Oxy-Acetylene, Basic Arc Welding
Delmar Publishers.

Lincoln, Lessons in Arc Welding Lincoln Electric Co. Ltd.

Jefferson, T.B., Arc Electrode Manual 4th Edition, Monticello Books
(Lake Zurich, Illinois, U.S.A. 60047).

Jefferson, T.B. Metals and How to Weld Them Welding Engineering
Publications Inc. 1976 Edition.

*Refers to prescribed learning resource.

CONTENT SUMMARY

1. Introduction to Welding
   - course overview
   - career patterns

2. Safety
   - unsafe acts
   - unsafe conditions

3. Fusion Welding
   - oxy-acetylene equipment
   - setting up new equipment
   - gas pressure and flame adjustments
   - production of gases
   - filler rods
   - shop practices
   - arc-welding, basic process
   - polarity/circuitry
   - electrode
   - types of welds

4. Thermal Separation
   - safety
   - theory of metal oxidation
   - cutting equipment
   - straight and bevel cutting
   - piercing

5. Measurement, Tools and Shop Equipment
   - measurement and layout tools
   - hand tools
   - power tools and machines

6. Braze Welding and Soldering
   - brazing
   - soldering

7. Fabrication and Repair
   - use of shop tools and equipment
   - planning and project building
   - repair procedures

TOPIC 1: INTRODUCTION TO WELDING VRM32R

GENERALIZATION: Welding is a necessary and useful trade in modern productive society.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Course overview	- discuss the expectations for successful completion of the course	1	
2. Career patterns	- discuss the criteria to be met in order to become a certified welder	1	
	- explore other trade patterns in which welding skill and knowledge would be advantageous		

NOTES:

TOPIC 2: SAFETY VRM32B

GENERALIZATION: Students should possess positive attitudes towards personal safety and the safety of others.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Safety:	- describe unsafe acts regarding concepts taught	10	
	- describe how work should be done safely		
- apparel	- use appropriate safety apparel and equipment		
	- report all accidents immediately		
	- discuss the following as they relate to the welding area: - fire prevention - ventilation - electrical safety - shop equipment - oxy-fuel		

NOTES: Canadian Standards Association
Code for safety in Electric & Gas Welding & Cutting Operations CSA W117.
Head & Eye Protection Z94.

Compressed Gas Association
Safe Handling of Compressed Gas Cylinders

National Fire Protection Association
NFPA 51B, NFPA 51.

American Welding Society
AWS 749.1, AWS A6.1, AWS A6.0.

National Film Library
Safety Doesn't Happen; Safety For Welders;
How Fires Start in Industry; Your Richest Gift.

TOPIC 3: FUSION WELDING VRM32B

GENERALIZATION: Metals are fused together by the use of the oxy-acetylene and electric arc welding processes.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
OXY-ACETYLENE	The student will:	40	
1. Oxy-acetylene equipment	- develop a welding skill and knowledge such that he/she can meet simple shop standards - demonstrate basic knowledge in use of oxy-acetylene equipment, such as: - cylinders - regulators - hoses - tips - torches		
2. Setting up new equipment	- demonstrate safe procedures in start up and shut down of equipment		
3. Gas pressure and flame adjustments	- demonstrate correct procedure for setting pressure and adjusting flames		
4. Production of gases	- discuss the production of the gases used in oxy-fuel welding		
5. Filler rods	- discuss the types of filler rods used in oxy-acetylene welding		
6. Shop practices:			
- basic welds	- demonstrate an ability to do basic shop welds on 16 gauge through 11 gauge material		
- out of position (optional)	- perform welds in positions other than flat		

TOPIC 3: FUSION WELDING (continued) VRM32B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
Arc Welding		40	
1. Basic arc welding	- describe the electric arc welding process - describe straight and reverse polarity - describe the welding circuit in reference to volts, amps, burn-off rate and arc control - describe the different electrodes used for mild steel welding - describe the purpose of the electrode oven for storage - demonstrate the ability to perform various basic welds using the electric arc process		

NOTES: Oxy-fuel includes oxygen and the following gases: acetylene, hydrogen, propane natural gas, mapp gas.

TOPIC 4: THERMAL SEPARATION VRM32B

GENERALIZATION: Some metals can be separated by using the thermal separation process.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5	
1. Safety	- describe unsafe conditions and acts related to welding		
2. Theory of metal oxidation	- explain why some metals can be thermally separated using the oxy-fuel process and others cannot		
3. Cutting equipment	- describe the difference between torches and the difference in cutting tips		
	- set cutting pressures correctly		
4. Straight and bevel cutting	- use oxy-fuel equipment to perform straight and bevel cuts		
5. Piercing	- pierce and cut holes in steel plate		

NOTES:

TOPIC 5: MEASUREMENT, TOOLS AND SHOP EQUIPMENT VRM32B

GENERALIZATION: Welders are required to use a variety of tools and equipment.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3	
1. Measurement and layout tools	- demonstrate the ability to use basic measurement and layout tools		
2. Hand tools	- demonstrate the ability to use basic hand tools		
3. Power tools and machines	- demonstrate the ability to use safely the power tools available, such as: - grinders - shears - punches		

NOTES:

TOPIC 6: BRAZE WELDING AND SOLDERING VRM32B

GENERALIZATION: Brazing and soldering are used to join metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	7	
1. Braze welding	- demonstrate the ability to braze weld mild steel		
	- indicate when the metal is too hot or too cold for braze welding		
2. Soldering	- demonstrate the proper use of fluxes and determine the correct flux for the different metals		
	- demonstrate the proper tinning of metals		
	- demonstrate proper soldering techniques		

TOPIC 7: FABRICATION AND REPAIR VRM32B

GENERALIZATION: Welding processes are used extensively in metal fabrication.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	18	
1. Use of shop tools and equipment	- demonstrate the ability to build projects which indicate an acceptable level of welding ability		
	- demonstrate the ability to repair projects which indicate an acceptable level of welding ability		

RELATED MECHANICS 32C

A Developmental Module, approved by the Associate Director of Curriculum for the Practical Arts, may replace any of the following modules: Related Mechanics 22A, 22B, 22C, 32A or 32B.

COURSE CONTENT

RELATED MECHANICS 32C (5, 10 CREDITS)

Advanced study may be continued in any of the topics covered in the courses listed under related mechanics or on the job training under the supervision of the Related Mechanics teacher and a journeyman on the job.